

BIRDS COLLECTED DURING THE WHITNEY SOUTH SEA
EXPEDITION. 51¹ON THE FRUIT PIGEONS OF THE *PTILINOPUS PURPURATUS* GROUP

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The Whitney South Sea Expedition was able to secure nearly all of the forms of *Ptilinopus* found in Polynesia, Melanesia and Micronesia. A preliminary report by Dr. Robert Cushman Murphy on some of the Polynesian forms has appeared in Amer. Mus. Novitates, Nos. 115 and 124. Dr. Ernst Mayr, always generous with advice and assistance, has been most helpful in the preparation of this paper.

The forms of *Ptilinopus* which are con-

sidered here are included by Salvadori (1893, Cat. Birds Brit. Mus., XXI, p. 83) in three subgenera: *Ptilopus*, *Ptilopodiscus* and *Cyanotreron*. These subgenera were based on characters such as length of tail, color of cap and size of bill, which are now known to vary within a single species. For a recent discussion of the synonymy of the genus, see Peters (1938, Proc. Eighth Internat. Ornith. Cong., Oxford (1934), p. 378).

THE *PURPURATUS* GROUP

On first studying these birds we were inclined to agree with Rensch (1929, Proc. Sixth Internat. Ornith. Cong., Copenhagen (1926), p. 235) that certain members of this genus could be included within a single "Artenkreis." Further study, however, has convinced us of two things: that Rensch's brief survey of the distribution of *Ptilinopus* was by no means complete enough, having left out eight related forms, and that no proper indication of the real relationships of these birds had been made. Recently Mayr (1940, Amer. Naturalist, LXXIV, p. 271) has pointed out the possibility that a superspecies, *Ptilinopus purpuratus*, could be established which would include not only Rensch's red-capped birds, but also the purple-crowned *purpuratus* and allied forms. He also suggested that the birds from the Marquesas Islands repre-

sented a double invasion by the same ancestral stock.

Our survey of this group has convinced us that the situation is even more complex. Mayr defines a superspecies (1931, Amer. Mus. Novitates, No. 469, p. 2) as "a systematic unit containing geographically representative species that have developed characters too distinctive to permit the birds to be regarded as subspecies of one species." We agree with Mayr that all the small fruit pigeons in the following list belong to the same group. However, this includes two cases of geographical overlapping: (1) *perousii* and *porphyraceus*, both of which occur on some of the Fijian, Tongan and Samoan Islands; and (2) *dupetithouarsii* and *mercierii* in the Marquesas. Thus the term superspecies is, by definition, inapplicable, and we can identify this aggregation of related forms only by calling them the *purpuratus* group after the earliest named species.

¹ The last ten papers of this series are Amer. Mus. Novitates, Nos. 1056, 1057, 1091, 1116, 1133, 1144, 1152, 1166, 1175 and 1176.

CHARACTERS OF THE GROUP

In general it may be said that birds of this group are characterized as follows:

1. Scapulars, tertials and sometimes wing-coverts with purple or dark bluish or greenish centers forming spots.
2. Breast feathers bifid.
3. First primary falcated.
4. Crown-patch present.

An examination of the adult plumages of these birds has led us to divide them into two sub-groups, each with its own more or less constant characters, and a study of the immature birds has corroborated this classification. Comparing the two we find the following differences:

	SUB-GROUP A Polynesia	SUB-GROUP B Melanesia, Micronesia, western Polynesia
Scapular spot	dark green or blue	light purple
Tail bar	gray, subterminal	yellow, terminal
Abdominal area	color gradates from breast to abdomen	sharp line of division between breast and abdomen

RANGE OF THE GROUP

OLD STOCK

1. *P. monachus* (Halmahera and Batjan).
2. *P. coronulatus* and races (Aru Islands and New Guinea).
3. *P. regina* and races (Lesser Sunda Islands from Flores to Timor Laut, Banda and Kei Islands, and northern and eastern Australia).
4. *P. roseicapilla* (Marianas Islands).

Island; *ponapensis*, Ponape and Ruk Islands; and *pelewensis*, Palau Islands).

SUB-GROUP A

5. *P. richardsii* and races (southeastern Solomon Islands).
6. *P. greyii* (Gower Island, Solomons, and southern Melanesia from Duff Island to New Caledonia).
7. *P. porphyraceus* and races (*porphyraceus*, Fiji and Tonga Islands; *graeffei*, Wallis, Fotuna and Niuafoou Islands; *fasciatus*, Samoan Islands; *hernsheimi*, Kusaie

8. *P. rarotongensis* (Cook Islands).
9. *P. purpuratus* and races (*chrysogaster*, western Society Islands; *purpuratus*, Tahiti Island; *frater*, Moorea Island; *chalcurus*, Makatea Island; *coralensis*, Tuamotu Islands; and *insularis*, Henderson Island).
10. *P. huttoni* (Rapa Island, Austral Islands).
11. *P. dupetithouarsii* and races (*dupetithouarsii*, southern Marquesas Islands; and *viridior*, northern Marquesas Islands).
12. *P. mercierii* and races (*mercierii*, Nukuhiva Island; and *tristrami*, Hivaoa Island, Marquesas Islands).
13. *P. perousii* and races (*perousii*, Samoan Islands; and *mariae*, Fiji and Tonga Islands).

HISTORY OF THE GROUP

The center of distribution for this genus of fruit pigeons seems to lie in the Papuan region. The *purpuratus* group has three species which have been grouped with the Papuan species *coronulatus* as "Old Stock" in the following discussion. They are *monachus*, which is found to the west in the Moluccas, *regina*, which occurs in the south and southwest, and *roseicapilla* from the Marianas. The rest of the species are found today to the east and north on the smaller islands. The fact that the two sub-groups overlap in central Polynesia, al-

though they have slightly different ecological preferences, inclines us to believe that they have been derived from two different waves of immigration.

Sub-group A was the first arrival. Its geographic representative, *perousii*, occupies the higher land on the larger and older islands. Furthermore, the species of this sub-group are much better defined and more widely divergent than those of the other sub-group.

Sub-group B has arrived in central Polynesia from the Melanesian area, where

its representatives, *greyii* and *richardsii*, still exist. From Fiji as a base, the species *porphyraceus* probably colonized Micronesia.

In the following discussion all measurements are in millimeters (1932, Amer. Mus. Novitates, No. 516, p. 1) and refer to adult males unless stated otherwise. As we are concerned here mostly with the purely Polynesian species, we have omitted a detailed discussion of the non-Polynesian forms which are listed and described by Salvadori (1893, Cat. Birds Brit. Mus., XXI, pp. 95-122). Only those characters of each form are given which are either diagnostic or of importance as phylogenetic clues. For detailed descriptions, see Salvadori (*loc. cit.*). For the synonymy of these forms, see Peters (1937, Birds of the World, III, pp. 28-33). Two terms used in the discussion should perhaps be defined. "Abdominal band" is a band of color serving as a sharp line of demarcation between the breast and abdomen; "abdominal spot," a patch or spot of color on the abdomen, usually somewhat below the area of the bar and varying considerably in size.

OLD STOCK

Ptilinopus monachus (Temminck)

MALE.—Crown-patch blue with a narrow yellow hind border; scapular spots emerald green, only slightly darker than rest of upper parts; tail-bar narrow, greenish gray and terminal, obscured on central rectrices and outer webs of outer rectrices; a sharply defined yellow streak on the chin; bifid breast feathers much reduced; abdominal band a round spot concolorous with crown.

FEMALE.—Differs from all other members of the *Ptilinopus purpuratus* group, except *perousii*, by being very different from the male, having only a tinge of blue on the crown and lacking the chin-streak and the abdominal band.

WING.—98-104; tail-wing ratio 60-61%.¹

RANGE.—Halmahera and Batjan.

This species is very closely related to

coronulatus. Both have the breast, neck and cheeks green like the back, the abdominal band a small, round, sharply defined spot, and the abdominal spot sometimes present as an orange wash below the band and sometimes lacking. *Ptilinopus monachus* differs from *coronulatus* by its pronounced sexual dimorphism, a character sufficiently important to separate it as a distinct species.

Ptilinopus coronulatus (G. R. Gray)

Crown-patch violet to pale lilac gray or pale pink; scapulars and tertials with pronounced dark green spots; breast green, fading to bluish gray on sides of head and whitish on throat; abdominal band and spot as in *monachus*, the former concolorous with the crown.

WING.—107-120.5; tail-wing ratio 55-62%.

RANGE.—New Guinea and adjacent islands (Aru, Salawati, Japen, Manam) (five subspecies).

Ptilinopus regina Swainson

Crown-patch deep aster purple to pale gray or white; scapulars and tertials with pronounced dark blue spots; tail-bar yellowish white to gray, usually broad, sub-terminal and partly obscured; abdominal spot covers the upper abdomen and completely surrounds the abdominal band.

WING.—116.5-135; tail-wing ratio 57-63%.

RANGE.—Lesser Sunda Islands from Flores to Timor Laut; Banda and Kei Islands; Daru Island (southern Papua), and northern and eastern Australia (five subspecies).

Compared to the others this species, with its five subspecies, seems the most closely related to the Papuan stock.

Ptilinopus roseicapilla (Lesson)

Similar to *regina*, but crown and abdominal band darker; malar apex concolorous with crown; hind neck more grayish; tail-bar wider and paler.

WING.—129-131.5; tail-wing ratio 59-61%.

RANGE.—Marianas Islands (Guam, Rota, Tinian and Saipan).

¹ Tail-wing ratio equals length of tail in per cent of wing-length.

The range of this isolated species is remarkable. The similarity of the bird to the Australian *regina* is so striking in every particular that we are forced to conclude that the two must be closely related despite a separation in range of 1,400 miles.

SUB-GROUP B

***Ptilinopus greyii* Bonaparte**

Malar apex not concolorous with crown; hind neck shows a tendency to be colored like the breast; scapular spots light purple; tail-bar gray and broad with traces of a narrow green terminal bar; abdominal band reduced to a dark purple line along the upper edge of the extensive abdominal spot which is aster purple, paler in the region of the vent; under tail-coverts wine purple.

IMMATURE.—Upper parts, entire head, neck, breast and flanks dark green; remiges and feathers of the tail, back and breast narrowly margined, and wing-coverts and feathers of the rest of the under parts broadly margined with pale yellow; scapular spots emerald green; under tail-coverts pale yellow.

This immature plumage is similar in all the forms of the *purpuratus* group, showing only slight variations of color or of extent of the yellow edging, except in sub-group A, that is, in *perousii* and the eastern Polynesian forms. The immature plumage of that sub-group will be described below.

WING.—119–131; tail-wing ratio 61–68%.

RANGE.—New Caledonia, Loyalty Islands, New Hebrides, Banks, Torres, Santa Cruz, Reef Islands and Gower Island in the Solomons. The Whitney Expedition collected specimens on the following islands: Gower Island in the Solomons; Treasurer's and Disappointment Islands in the Duff Islands; Lomlom and Tenualoa in the Reef Islands; Santa Cruz, Utupua and Vanikoro in the Santa Cruz group, Hiu and Low Islands in the Torres Islands; Bligh, Valua, Gaua and Meralav, Banks Islands; Santo, Malo, Aoba, Aurora, Pentecost, Ambrym, Pauuma, Malekula, Lopevi, Epi, Tongoa, Mai, Makura, Nguna, Mau, Efate, Erro-

manga, Tanna and Aniwa Islands, New Hebrides, and Uvea, Lifu and Maré Islands, Loyalty Islands. Immature birds were collected at all seasons. Molting adults were taken in April, August and November, and immatures molting into adult plumage in April.

Birds from the Loyalty Islands, the type locality, seem rather uniformly large with the crown-patch extending rather far back and the hind neck more uniformly greenish. The Gower Island population seems uniformly small (wing 119.5–127, as against 128–130.5 in the Loyalty Island specimens). It is also paler on the hind neck and has, in many cases, more orange on the abdomen and under tail-coverts. Birds from this island might be separable from typical *greyii* were it not that the intervening populations are mixed and show every variation between the two. This would indicate that a constant swamping occurs which is to be expected in a species with such excellent colonizing abilities. Birds from the Santa Cruz Islands and from Gower Island show a decided trend, in the color of the under parts, toward the Fijian *porphyraceus*.

Ptilinopus porphyraceus

We have included in this species the three Micronesian forms because their divergence does not seem pronounced enough to warrant their being kept as distinct species. They undoubtedly represent *porphyraceus* geographically.

In connection with the western Polynesian forms it is interesting to note that the Fijian form does not occur on the larger islands of the group, whereas the Samoan form occurs on all the islands. In the Fijis two other groups of fruit pigeons occur: *Ptilinopus perousii* and the *Chrysoena* group, whereas in Samoa only *P. perousii* is found. It may be that the presence of two other species has prevented the Fijian form from establishing itself on the larger islands. This might indicate that the Fiji Islands were the original home of *perousii*. Presumably *porphyraceus* arrived there at a later date, and *perousii* has probably spread to Samoa rather recently.

Ptilinopus porphyraceus porphyraceus
(Temminck)

Similar to *greyii*, but hind neck always pale gray; subterminal tail-bar grayish yellow; throat whitish; breast usually more gray, less yellow, abdominal band dark greenish blue; abdominal spot purplish pink mixed with the blue of the band, often lacking; rest of abdomen green; crissum yellow; under tail-coverts orange-yellow.

WING.—132–144.5; tail-wing ratio 57–63%.

RANGE.—Tonga Islands, Fiji Islands (Lau Group west to Vatu Leile and north to Yendua), Rotumah, Keppel and Boscawen. The Whitney Expedition collected specimens on the following islands: Tonga Islands; Eua, Tongatabu, Hongahapai, Hongatonga, Telekivavau, Nomuka, Aua, Tongva, Haafeva, Uihā, Ava, Uoleva, Foa, Haano, Moungaone, Ofalanga, Tofua, Kao, Late, Ovaka, Kapa, Vavau; Keppel and Boscawen.

Fiji Islands; Ongea Levu, Fulanga, Yangasa Cluster, Marambo, Kambara, Wangava, Namuka Ilau, Komo, Mothe, Oneata, Aiva, Lakemba, Vanua Vatu, Naiau, Thithia, Tuvutha, Katafanga, Mango, Munia, Thikombia Ilau, Avea, Naitamba, Wailangilala, Vatu Vara, Yathata, Thombia, Yanutha, Watanua, Ngele Levu, Nukumbasanga, Yendua, Namena, Makongai, Wakaya and Vatu Leile; and Rotumah Island.

Immature birds were collected in February, August and September. Molting adults were taken in July, August, September, October, November and December, and immature birds molting into adult plumage in February, May, August, September, October and November.

The populations which comprise this race have a wide individual variation, showing that the same problem is encountered in *Ptilinopus* that has been noticed before in the cases of some of the other Polynesian genera (Mayr, 1931, Amer. Mus. Novitates, No. 469, p. 7; No. 486, p. 16; No. 504, p. 20; and 1932, Amer. Mus. Novitates, No. 516, p. 5). Evidently this is due to constant swamping of the different popula-

tions by migration between the various islands.

In Fijian specimens there is a tendency for the abdominal band and the upper abdomen to be less frequently suffused with pink, and the orange under tail-coverts to be paler and more yellowish than in Tongan individuals. Rotumah birds seem to be virtually identical with Fijian birds. Of a series of ten birds, five show a rather reduced green terminal tail-bar and a slight increase in the yellow tinge of the gray subterminal bar. One shows a trace of the large brownish red abdominal spot that seems to be characteristic of *graeffei*.

Ptilinopus porphyraceus graeffei
Neumann

Similar to *porphyraceus*, but scapular spots somewhat paler; green terminal tail-bar usually lacking and subterminal bar much brighter yellow; abdominal spot brighter, more brownish red, less pinkish, more frequently present, and generally extending farther down over the abdomen.

WING.—131–141; tail-wing ratio 57–61%.

RANGE.—Wallis, Fotuna and Niuafoou Islands. The Whitney Expedition collected specimens on all three islands. Birds collected were molting in April. Immature specimens molting into adult plumage were collected in April and May.

The series in the American Museum collection from these islands indicates that *graeffei* is a hybrid population between *porphyraceus* and *fasciatus* which appears to be constantly crossed with individuals from the Fijis and Samoa. Collectors, including one of us (Ripley), have often seen these birds far out at sea. Birds from Niuafoou approach the Samoan form, those from Fotuna the Fijian, while Wallis Island birds are intermediate. Wallis being the most isolated of these islands (about 250 miles from the nearest Fijian and 200 miles from the nearest Samoan point of land) its population is less subjected to swamping. All three populations contain every gradation between *porphyraceus* and *fasciatus* but approach each other closely enough to be included, for the sake of convenience, under one name,

graeffei, though it should be remembered that this designates a hybrid population.

A description of the American Museum series from the different islands follows:

WALLIS ISLAND.—Three males have a dark reddish abdominal band; two have a dark greenish abdominal band. Two males approach *fasciatus* from Samoa in the color of the abdominal spot, while one approaches typical *porphyraceus*. The other specimens are intermediate or have rather subdued markings. Every other character, such as scapular spots or tail-bar, shows a similar variation.

FOTUNA ISLAND.—Of two adult males of the series, one has a purplish abdominal spot and orange under tail-coverts, like some Tongan birds; the other has the brownish red abdominal spot of *graeffei*. The yellow tail-bar is subterminal in the bird with Tongan affinities, as it should be, while that of the other is typical of *fasciatus*.

NIUAFU ISLAND.—Four males have the brownish red abdominal spot of *fasciatus*. Four others have the purplish, more reduced abdominal spot of *porphyraceus*.

***Ptilinopus porphyraceus fasciatus* Peale**

Differs from typical *porphyraceus* in having the abdomen bright reddish brown, the dark abdominal band much more suffused with pink, the under tail-coverts slightly deeper orange, the spots on scapulars and tertials paler, more pinkish, and the tail-bar yellow, usually terminal.

IMMATURE.—Similar to immature *greyii*, but the green of the breast extending down more onto the abdomen.

WING.—129.5–150; tail-wing ratio 55–60%.

RANGE.—Samoa Islands (Savaii, Upolu, Tutuila, Ofu, Olosenga and Tau). The Whitney Expedition took specimens on all these islands. Immature birds were collected in January, February, May, October and November. One nestling was collected in May. Molting adults were taken in January, February, March, April and November.

The measurements of the populations of these islands indicate a regular cline in size from west to east. The following averages

of wing-length show this clearly: Savaii 133, Upolu 136, Tutuila 139.1, Ofu and Olosenga 139.8, and Tau 145.6. Samoan birds are very variable in the shade and extent of color on the abdomen and abdominal band, some being indistinguishable from *graeffei*. In eight specimens there is a faint indication of the green terminal tail-bar. There is no color difference between birds from Savaii at the western and the Manua Islands at the eastern limit of the range, and the difference in size is too gradual to warrant any separation.

MICRONESIAN FORMS

The relationship of the species formerly known as *ponapensis* seems to us so close to *porphyraceus* as to make the two assemblages conspecific. In every case they are perfectly representative.

***Ptilinopus porphyraceus hernsheimi* (Finsch)**

Similar to *fasciatus*, but crown-patch darker with the yellow hind border almost lacking; scapular spots intermediate between those of *porphyraceus* and those of *fasciatus*; tail-bar very broad and bright yellow, often deeper, no dark terminal bar; abdominal band lacking; abdominal spot sometimes present as a brownish red tinge on the olive green abdomen; yellow of lower abdomen more restricted; crissum yellow; under tail-coverts orange.

WING.—127–135; tail-wing ratio 51–61%.

RANGE.—Kusaie Island, Caroline Islands. The single immature specimen was taken by the Whitney Expedition in April. Adults were found molting in January, February, March and April.

We consider *Ptilinopus marshallianus* Peters and Griscom (1928, Proc. New Eng. Zool. Cl., X, p. 104: Ebon Island, Marshall Islands), a synonym of *Ptilinopus porphyraceus hernsheimi* (Finsch). In the original description of *P. marshallianus* it was pointed out that the first primary of the type is less emarginated than in *hernsheimi*, more as in *coralensis*. This is a character of immaturity and seems untenable when the unique type is examined. It is identical in pattern with *hernsheimi*,

except that it lacks the yellowish coloring throughout. As it is known to have been in alcohol for many years before being made into a skin, and as the supposed locality, Ebon Island, Marshall Islands, was never very positive, it seems likely that it is simply a specimen of *hernsheimi* with a wrong locality and with the plumage changed by the action of the alcohol. The measurements (wing 124, tail 74, bill from base 15) are smaller than in the series of male *hernsheimi* that we have measured, but some females are equally small. We are indebted for the measurements to Mr. James C. Greenway, Jr., of the Museum of Comparative Zoölogy.

Ptilinopus porphyraceus ponapensis
(Finsch)

Similar to *hernsheimi*, but hind neck, cheeks and breast greenish yellow, not gray; tail-bar duller, more greenish, no dark terminal bar; abdominal band very dark, deep purple and green mixed; abdominal spot present as a faint reddish wash in about half the series examined; abdomen olive green; under tail-coverts more yellowish.

WING.—131–141; tail-wing ratio 51–57%.

RANGE.—Caroline Islands (Uala [or Moen] in the Ruk Group and Ponape). The Whitney Expedition collected immature birds in October, November and December, immature specimens molting into adult plumage in November and December, and a few molting adult specimens in November.

Specimens from the Ruk Islands differ very slightly from Ponape birds in having the crown consistently more purplish and the neck, cheeks, chin and breast less strongly washed with yellow, but these differences are not marked enough to warrant their separation. The measurements of the two populations are the same.

Ptilinopus porphyraceus pelewensis
(Hartlaub and Finsch)

Differs from *ponapensis* as follows: crown darker, more purple, paling toward the forehead; the yellow hind border more pronounced, particularly at sides of crown;

tail-bar narrower, more grayish green, with traces of a green terminal bar; neck, cheeks and breast gray; throat white; bases of bifurcated central breast feathers dahlia purple; dark abdominal band reduced to a line, entirely lacking at sides of breast; abdomen orange, shading to yellow on crissum; under tail-coverts maroon to wine purple.

IMMATURE.—Identical with the immature *greyii*, but yellow of abdomen more orange, less mixed with green; yellow edges of rectrices narrower terminally; and tail-bar less prominent.

WING.—133.5–134; tail-wing ratio 54–56%.

RANGE.—Palau Islands (Babeltop, Korror). One immature bird molting into adult plumage was taken in December and one molting adult specimen in November.

This form differs strikingly from all the other races of *porphyraceus* by having a purple breast-patch, an entirely orange abdomen and purple under tail-coverts. However, the upper parts are practically identical with those of *fasciatus*, and we feel that, though superficially rather different, it is a race of *Ptilinopus porphyraceus* and that its marked divergence is due to its isolated position at the periphery of the range of the species. As Mayr has pointed out (1941, Proc. Sixth Pacific Sci. Congress, IV [Zoology], p. 204), the fauna of the Palau Islands is principally of Papuan and Philippine origin, but in this case, as in those of *Halcyon cinnamomina*, *Ducula oceanica*, etc., the western Polynesian origin is rather obvious.

Ptilinopus richardsii

This species has a number of very distinctive features, but its general pattern shows relationship to sub-group B. The wide separation of its range from that of *greyii* and the small size of its entire population (it is apparently restricted to four small islands) are factors which might permit rapid speciation. It is, therefore, quite possible that, despite its dissimilarity, *richardsii* is nothing but an evolved offshoot of *greyii*. That the Gower Island population of *greyii*, equally isolated, has

not differentiated subspecifically indicates the recent colonization of that island.

The pink scapular spots are an exaggeration of the rather light purple scapular spots that are an important character of sub-group B, and the broad yellow tail-bar is as in *fasciatus* and *hernsheimi*. The characters of vestigial abdominal band and bright abdomen, by which this species resembles *pelewensis*, are probably due to parallel evolution of inherent traits of the sub-group.

Ptilinopus richardsii richardsii

(Ramsay)

Crown lilac gray; malar apex concolorous with crown; hind neck gray as the breast; scapular spots pink; tail-bar broad, bright yellow and terminal; bases of bifid central breast feathers yellowish olive; abdominal band usually lacking, sometimes present as a dark line across some central breast feathers; abdomen and under tail-coverts uniformly orange.

WING.—129–135.5; tail-wing ratio 53–58%.

RANGE.—Southeastern Solomon Islands (Ugi and Santa Anna). One immature specimen molting into adult plumage was secured in March, and molting adults were taken in January and March.

***Ptilinopus richardsii cyanopterus* Mayr**

For the description and measurements of the adult of this race, see Mayr, 1931, Amer. Mus. Novitates, No. 486, p. 10.

IMMATURE.—Similar to the immature *greyii*, but green of crown shading to gray on forehead; throat more yellow; green of breast lighter, more grayish; yellow edges of rectrices very narrow; and tail-bar poorly defined.

RANGE.—Rennell Island. Immature specimens, immatures molting into adult plumage and one molting adult were collected in August.

SUB-GROUP A

Eastern Polynesia has probably received its populations of *Ptilinopus* by way of central Polynesia. Except for the Marquesan species, all the eastern Polynesian

forms have certain features in common, which they do not share with those from western Polynesia, and so seem more closely related to each other than to the latter. These traits we have given in the introduction under the history of the Polynesian *Ptilinopus*.

Some of the outlying populations have diverged too far to be included as subspecies of the main stock, but birds from the Society Islands and the Tuamotus are so much alike that we consider them all subspecies of *purpuratus*.

The two species from the Marquesas Islands are so unlike the rest of the eastern Polynesian forms that they may possibly belong to sub-group B. We will discuss this in the introduction to these two species.

***Ptilinopus rarotongensis* Hartlaub and Finsch**

According to Hartlaub and Finsch's original description this bird is most nearly allied to *chrysogaster* from the western Society Islands, "but may be distinguished at once by the dark red pectoral patch." Lacking any specimens, it is impossible for us definitely to assign this species to either of the two sub-groups of Polynesian *Ptilinopus*, though from the plate of it (1873, Jour. Mus. Godeffr., I, p. 49), little as this shows the features by which the two groups may be distinguished, it seems to belong to sub-group A.

RANGE.—Rarotonga Island, Cook Islands.

***Ptilinopus purpuratus chrysogaster*
(G. R. Gray)**

Crown-patch lilac shading to lavender on forehead, yellow hind border tinged greenish; hind neck gray as the breast; scapular spots emerald green; tail-bar yellowish gray, broad and pale, usually subterminal; throat yellowish white; cheeks, neck and breast gray, the bifid breast feathers show yellowish bases; upper abdomen greenish yellow; lower abdomen, crissum and under tail-coverts yellow; flanks and feathered tarsi grayish green.

WING.—136–147; tail-wing ratio 57–59%.

RANGE.—Western Society Islands (Bora-

bora, Tahaa, Raiatea and Huaheine). Molting adults were taken in January.

In general, this and the succeeding forms are characterized by duller, more juvenile appearing plumage of a more fluffy consistency.

Murphy (1924, Amer. Mus. Novitates, No. 115, p. 4) has stated that many of the smaller Polynesian species of *Ptilinopus*, such as *perousii*, *purpuratus*, *coralensis* and *dupetithouarsii*, have only twelve rectrices. Larger series have disproved this. Of twenty specimens of *chrysogaster* examined by us, ten proved to have damaged or molting tails, five had tails of twelve feathers, four of thirteen, and one of fourteen. It is hard to decide whether this variability is natural or due to the accidental loss of some of the feathers.

Ptilinopus purpuratus purpuratus
(Gmelin).

Similar to *chrysogaster* but duller; crown-patch more grayish purple, brightest on occiput, yellow hind border more poorly defined; tail-bar much reduced, often interrupted, gray and subterminal; throat whitish; gray of breast shading to grayish green of abdomen; crissum yellowish white deepening to pale yellow on under tail-coverts.

WING.—Ad. ♂♂ 148.5–159.5 (150.5), ad. ♀♀ 138–151.5 (147.5).

TAIL.—ad. ♂♂ 85–95 (87.1), ad. ♀♀ 78–92 (83.2); tail-wing ratio 57–61%.

CULMEN.—11–12.

TARSUS.—29–29.5.

RANGE.—Tahiti, Society Islands. Immatures molting into adult plumage were collected in January. Molting adults were taken at all seasons.

***Ptilinopus purpuratus frater*, new subspecies**

TYPE.—No. 189608, Amer. Mus. Nat. Hist.; ♂ ad.; Moorea, Society Islands; June 23, 1921; Whitney South Sea Expedition (R. H. Beck).

MALE AND FEMALE.—Similar to typical *purpuratus* but smaller; crown-patch brighter purple; and hind neck and under parts more suffused with yellow in some specimens.

WING.—Ad. ♂♂ 143–150 (146.9), ad. ♀♀ 138.5–145.5 (145.8).

TAIL.—Ad. ♂♂ 82–87 (86.7), ad. ♀♀ 82.5–85 (83); tail-wing ratio 57–61%.

CULMEN.—12–12.5.

TARSUS.—28.5–30.

RANGE.—Moorea, Society Islands. Molting adults were taken in June and July.

This population and that from Tahiti show a rather marked divergence from the other members of the species in the still more juvenile, unspecialized character of the plumage. It is interesting in this connection to note that the first primary bears out this impression by being only very slightly emarginated. The plumage has a fluffy degenerate quality, the crown-patch is very subdued, and there is a tendency for the colors to blur together, the scapular spots being only faintly indicated, and the colors of abdomen and breast shading into each other.

Birds from Tahiti and Moorea show some diversity in the number of rectrices, but fourteen seems to be the usual number. Of the series examined, eleven individuals have less than twelve tail feathers, eight have twelve, fifteen have thirteen, and seventeen have fourteen rectrices. One Tahiti specimen has sixteen tail feathers.

Ptilinopus purpuratus chalcurus
(G. R. Gray)

Differs from *coralensis* principally in the greater extent of the color on the crown-patch. (See also Murphy, 1924, Amer. Mus. Novitates, No. 124.)

WING.—Ad. ♂♂ 136.5–141.5 (138.9), ad. ♀♀ 127–134 (129.8).

TAIL.—Ad. ♂♂ 93–100 (96.1), ad. ♀♀ 85–91.5 (88.5); tail-wing ratio 66–71%.

CULMEN.—14.

RANGE.—Makatea Island, Tuamotu Group. Molting adults and immatures molting into adult plumage were taken in August.

It is interesting to note that in two specimens there is an indication of the orange wash on the abdomen that is present in some of the populations of *coralensis*.

***Ptilinopus purpuratus coralensis* (Peale)**

Similar to *chalcurus*, but crown-patch lighter purple shading to gray on forehead, hind border present but narrow, ill defined and grayish; hind neck, cheeks and breast

more gray; and light outer edgings of rectrices better defined.

IMMATURE.—Differs from the adult as follows: crown, cheeks and hind neck green as the back; feathers of crown, back, lesser wing-coverts and breast narrowly edged with whitish or pale yellow; pale edgings of rectrices and wing feathers broader; breast and upper abdomen more uniformly grayish olive.

A nestling plumage occurs in this species and in all the forms of sub-group A. In this the basal gray of the feathers of the under parts is more conspicuous, the light tips, yellowish on the breast and white on the abdomen, are more extensive and not sharply defined, and there is no grayish olive on the breast, as in the immature. We have not been able to find a nestling plumage differing from the immature plumage in the series of immatures of group B examined.

WING.—Ad. ♂♂ 130–142 (137.9), ad. ♀♀ 126–138 (133.5).

TAIL.—Ad. ♂♂ 86–100 (90.3), ad. ♀♀ 83–95 (91.9); tail-wing ratio 65–70%.

CULMEN.—12–13.5.

RANGE.—Tuamotu Islands. The Whitney Expedition collected specimens on the following islands: Tikahau, Rangiroa, Arutua, Niaou, Apataki, Ahii, Manihi, Toao, Fakarava, Aratika, Kauehi, Takaroa, Taiaro, Raraka, Faite, Tahanea, Katiu, Tepoto, Hiti, Makemo, Taenga, Tenararo, Tenarunga, Maturei Vavao, South Marutua and Tuanake. Immature specimens were collected in February and May, immatures molting into adult plumage in February, March, May and September, and molting adult birds in February, March, May, June, August and September.

No specimens were collected between Taenga and Tenararo, a distance of about 500 miles, although the Whitney Expedition visited some of the intervening islands. Birds from Rangiroa, Niaou and the three islands in the southeastern group, Tenararo, Tenarunga and Maturei Vavao, tend to have a faint orange wash on the abdomen. The range of the individual variation between the color of fresh and worn plumage seems to be conspicuous in these birds. No noticeable size differences

could be detected among any of these populations.

***Ptilinopus purpuratus insularis* (North)**

Similar to *coralensis* but larger; bill longer (13.5–15, as against 12–13.5); crown-patch brighter, more pinkish, uniform in color; hind margin brighter yellow and better defined; back darker, more greenish; tail-bar less well defined; tail relatively longer; throat-patch whiter, more extensive; hind neck, cheeks and breast darker, more bluish gray; bases of bifid breast feathers greenish gray, not yellowish green; crissum more whitish. The usual number of rectrices seems to be fourteen.

WING.—Ad. ♂♂ 144.5–155 (147.3), ad. ♀♀ 139–148 (143.1).

TAIL.—Ad. ♂♂ 104–110 (107.4), ad. ♀♀ 100.5–106.5 (104.1); tail-wing ratio 69–73%.

CULMEN.—13.5–14.5.

RANGE.—Henderson Island, south Pacific Ocean. Immatures were collected in April. Molting adults were taken in March and April.

***Ptilinopus huttoni* (Finsch)**

Bill very long (19.5–21.5); crown-patch and malar apex rose purple; throat washed with the same color; back as in *coralensis*; scapular spots dark and pronounced; tertials with pinkish outer margins; tail very long; tail-bar lacking; light outer edges of rectrices conspicuous; abdominal spot magenta, large and ill defined; crissum pale yellow; under tail-coverts pink. The usual number of rectrices seems to be fourteen.

IMMATURE.—Similar to the adult, but crown-patch dull greenish washed with pink on forehead; hind neck and upper back more greenish; wing feathers and coverts edged yellowish white; abdominal spot obscured or lacking; and under tail-coverts pale yellow, not pink.

WING.—Ad. ♂♂ 164–175 (169.4), ad. ♀♀ 162–172 (165.8).

TAIL.—Ad. ♂♂ 111–125 (118), ad. ♀♀ 111–122 (115.4); tail-wing ratio 74–76%.

CULMEN.—20.5.

RANGE.—Rapa Island, Austral Islands. Immature specimens were collected in December, February and April, and molting adults in April.

Although this large *Ptilinopus* undoubtedly belongs to the *purpuratus* group, it is sufficiently distinct from it to be retained as a separate species.

THE MARQUESAN SPECIES OF *PTILINOPUS*

The two Marquesan species show characters in common with both sub-group A, the *purpuratus* sub-group and sub-group B, the *porphyraceus* sub-group, but they do not agree very closely with either and should, perhaps, be considered separately. The dark scapular spots are as in *huttoni* and, on the whole, tie them in with *purpuratus*. The broad, yellow, terminal tail-bar of *dupetithouarsii* is identical with that of some forms of sub-group B, and the more subdued subterminal bar of *mercierii* is as in other members of this group. The malar apex is concolorous with the crown as in some forms of both sub-groups, *richardsii* in one, and *huttoni* in the other. The markings of the under parts, while superficially rather like those of *peleuensis* and *richardsii*, might also have evolved from those of the *purpuratus* group. This is more apparent in *dupetithouarsii*. It is fairly certain that these two species have sprung from either of the two Polynesian sub-groups, more probably from sub-group B, though subsequently diverging considerably, and it is sufficiently evident that they are closely related to each other.

***Ptilinopus dupetithouarsii* *dupetithouarsii* (Neboux)**

Crown-patch white, concolorous with malar apex, hind border narrow, sharply defined, and mixed yellow and reddish; scapular spots dark blue, very sharply defined; light edges of tertials very broad; tail-bar broad, yellow and always terminal; neck, cheeks and breast light gray; bases of bifid breast feathers olive green; abdomen orange shading to yellow on crissum; upper abdomen sometimes shows a large pink spot; under tail-coverts yellow. This species has fourteen rectrices.

IMMATURE.—Similar to the immature *coralensis*, but crown and neck lighter, more yellowish; light feather edgings more

yellow, narrower on back, broader on tertials and tips of rectrices; centers of tertials emerald green; tail-bar broad and gray, subterminal, obscured on outer edges of rectrices.

In the nestling plumage of this species the feathers of the under parts are almost entirely dark gray with sharply defined, narrow, white tips, broader on the lower abdomen. The under tail-coverts are basally white shading to the tips which are pale yellow.

WING.—142.5–155.5; tail-wing ratio 57–61%.

RANGE.—Tahuata, Hiva, Fatuhiva and Motane Islands, southern Marquesas Islands. Immature birds were collected in July, September, October, November, December and January. Molting adults were taken in September, October, November, December and January.

***Ptilinopus dupetithouarsii viridior* (Murphy)**

Differs from *dupetithouarsii* by having the orange hind border of the crown-patch narrower, paler and less well defined and the breast tinged with more yellowish color.

WING.—143–147; tail-wing ratio 52–55%.

RANGE.—Nukuhiva, Huapu and Huahuna Islands, northern Marquesas Islands. Immature specimens were collected in October and November, and immatures molting into adult plumage and molting adults in September, October and November.

***Ptilinopus mercierii tristrami* Salvadori**

Crown-patch and malar apex approaching aster purple; hind border broad and yellow; scapular spots pronounced; tail-bar broad, yellowish gray and terminal; hind neck, cheeks and breast comparatively dark gray; throat-patch whitish or yellowish; abdomen, crissum and under tail-

coverts yellow, deeper on abdomen. This species has fourteen rectrices.

IMMATURE.—Similar above to the immature *dupetithouarsii*, but somewhat less yellowish on crown and hind neck; light feather edgings narrower on tertials and tail feathers; breast as in the adult, but tinged with green and with a few light yellowish feather edgings; abdomen paler yellow; and under tail-coverts yellowish white.

In the nestling plumage the under parts are evidently as in *dupetithouarsii*.

WING.—131.5–147; tail-wing ratio 57–60%.

RANGE.—Hivaoa Island, Marquesas Group. One immature bird was collected in November. Molting adult specimens were taken in October, November and January.

Ptilinopus mercierii mercierii (Des Murs and Prevost)

Similar to *tristrami*, but crown-patch darker, more purplish, extending backward to occiput, and without the yellow hind border; nape more yellowish; back more olive-colored, less green; tail-bar yellow and terminal, not gray and subterminal; white throat-patch lacking; throat, sides of neck and breast yellowish green as the nape, not gray; and color of the breast shading into the yellow of the abdomen.

RANGE.—Nukuhiva Island, northern Marquesas Islands.

There are no specimens of *P. m. mercierii* in the American Museum collection. Our diagnosis is based on Salvadori's description of the two races of *mercierii* (1893, Cat. Birds Brit. Mus., XXI, p. 110).

RELATIONSHIP AND VARIATION OF *PTILINOPUS PEROUSII*

***Ptilinopus perousii* Peale**

We have already mentioned (p. 2) our conviction that this species, though superficially different, is a member of one of the two sub-groups of Polynesian *Ptilinopus*, not a third sub-group by itself. An analysis of its color pattern might not be out of place here.

This species has evolved far from any primitive stock. It has also acquired sexual dimorphism, the specialized markings being restricted to the male.

The female resembles typical members of sub-group A, particularly *insularis*, the upper parts and tail-bar, respectively, being nearly identical. Below it is intermediate between *insularis* and the male *perousii*. There is a greenish tinge to the under parts, and the breast is grayish, while the area of the breast feathers with pink bases is smaller. Evidently the plumage of the male and the sexual dimorphism are superficial developments, and the colors of the female are more important in the classification of this species.

The pale coloring of the male may be due to lack of dark pigment, for, except for this and for the red bar on the back, the markings are just as in the female. It is inter-

esting to note that in many males the green seems not to have been entirely lost. In this plumage the feathers of the hind neck and rump are tipped with greenish, some scapulars and tertials are green, particularly on the inner webs, the rectrices are variable, green or only tipped with greenish, and the under parts are as the typical male. Seven males of the American Museum series of *perousii* are molting directly from the immature into the perfect adult plumage, while eight immature males are molting into this greenish plumage. Five males in the latter plumage in the American Museum series are marked as having enlarged gonads. This may be a retarded adult plumage, as is found in so many island birds including *Ptilinopus solomonensis* (Mayr, 1931, Amer. Mus. Novitates, No. 504, p. 7), in which case it is possible that other species of Polynesian *Ptilinopus* may have a similar plumage, though in them it would be very hard to trace. The fact that, in the whole Whitney Expedition series of *Ptilinopus perousii mariae*, at least half of the males in this green plumage are molting, many of them from the immature plumage, while most of the perfect males are not, would confirm this. Perhaps it is

a phase of the adult plumage, and males in this phase may never assume perfect male plumage. The occurrence of this greenish phase would show that the yellow, dimorphic, male plumage is a character not yet perfectly acquired by all specimens of the species. The red bar across the back is lacking in the female.

The similarity of the two races of *perousii* to each other would seem to point to their having only recently separated.

***Ptilinopus perousii perousii* Peale**

MALE.—Differs from *insularis*, the most similar member of sub-group A, as follows: a broad, deep red bar extends across the upper mantle onto the lesser wing-coverts; mantle and rump greenish yellow; wing-coverts, tertials and rectrices pale gray edged with greenish yellow; hind neck, cheeks and breast yellowish white; bases of bifid breast feathers magenta; abdominal bar broad and orange or reddish; abdomen yellowish white, under tail-coverts magenta; bill and tail proportionately shorter.

FEMALE.—Differs from *insularis* as follows: yellow hind margin of crown-patch lacking; hind neck greener; wing-coverts more conspicuously and rectrices less conspicuously edged with yellow; tail-bar less well defined; tips of breast feathers paler and bases darker, more greenish, some magenta on central ones; orange abdominal bar present; abdomen paler, more yellowish, under tail-coverts magenta; bill and tail proportionately shorter.

IMMATURE.—Above very like the immature *greyii*, more emerald green than immatures of typical sub-group A, particularly the wing and tail feathers; yellow feather edgings broader and more sharply defined, especially on the wing-coverts, tertials and breast. Under tail-coverts pink.

A nestling plumage occurs, in which the green of the breast is less pronounced and the feather edgings slightly broader and less distinct, but this is not so different from the immature plumage as in young birds of typical sub-group A. Under tail-coverts basally white, shading to the pale yellow tips.

WING.—136.5–139.5; tail-wing ratio 57–63%.

CULMEN.—5–6.5.

RANGE.—Samoan Islands. The Whitney Expedition collected specimens on Savaii, Upolu and Tutuila, and on Ofu, Olosenga and Tau Islands in the Manua Group. Molting and immature birds were taken at all seasons.

***Ptilinopus perousii mariae* (Jacquinot and Pucheran)**

MALE.—Similar to *perousii*, but white areas less yellowish; abdominal bar averaging a little more orange, less red; crown-patch and bar across wings and back perhaps averaging a little paler; and pink bases of breast feathers less conspicuous.

FEMALE.—Differs from the female *perousii* by having the under tail-coverts pale yellow, not magenta, though there is a little pink at their bases in a few specimens.

WING.—133–140; tail-wing ratio 60–63%.

CULMEN.—5–7.5.

RANGE.—Fiji and Tonga Islands. The Whitney Expedition collected specimens on the following islands: Turtle, Ongea Levu, Fulanga, Yangasa Cluster, Kambara, Namuka Ilau, Mothe, Olorua, Oneata, Aiwa, Lakemba, Totoya, Vanua Vatu, Naiiau, Katafanga, Mango, Munia, Thikombia Ilau, Vanua Mbalavu, Naitamba, Yathata, Taviuni, Kio, Vanua Levu, Yanganga, Yendua, Makongai, Wakaya, Viti Levu, Vatu Leile and Kandavu in the Fiji Islands, and on Tongatabu, Eua, Late and Tofua in the Tonga Islands. Immature specimens were collected in July and September, immatures molting into adult plumage in June, July, September, October, November and January, and molting adults in July, August, October, November and January.

Having examined a large series of birds collected by the Whitney South Sea Expedition, we have concluded that *cupidineus* Wetmore is not a valid race. It is stated correctly in the original description (1925, Ibis, p. 829) that the Tonga birds are less yellowish than those from Samoa, but the series from the Fijis that were used must

have been mostly in the greenish plumage, as they are described as greener above than the Tonga specimens.

In addition to slight color differences, *mariae* seems to have a proportionately shorter tail, on the average, than *perousii*.

